

THE CLAIMS

1. A syringe for sequentially administering different fluids comprising:

5 a syringe body having a hollow interior for receiving the fluids to be administered;

a syringe needle mounted at one end of the syringe body for administering the fluids therefrom;

10 a plunger mounted within the interior of the syringe body for movement therein toward the end of the syringe body comprising the syringe needle to force fluids outwardly from the interior of the syringe body through the syringe needle;

the plunger further comprising a piston forming a fluid tight seal with the interior of the syringe body;

15 a floating piston slidably supported within the hollow interior of the syringe body and forming a fluid tight seal with the syringe body which divides the syringe body into a first portion for receiving the first fluid to be administered and a second portion for receiving the
20 second fluid to be administered; and

the floating piston further comprising means for connecting the second fluid to be administered in fluid communication with the syringe needle after all of the first fluid to be administered has been discharged
25 therethrough.

2. The syringe according to claim 1 wherein the floating piston is further characterized by an upper portion forming a fluid tight seal with the interior of the syringe body, a lower portion comprising resilient means,
5 and a piercing needle mounted in and supported by the resilient lower portion and having a hollow interior.

3. The syringe according to claim 2 wherein the resilient means of the lower portion comprises a spongy material.

10 4. The syringe according to claim 2 wherein the resilient means of the lower portion comprises a gas.

5. The syringe according to claim 2 wherein the first portion of the floating piston comprises a non-coring elastomeric material.

15 6. The syringe according to claim 2 wherein the lower portion of the floating piston comprises a spongy material having the piercing needle mounted therein and a resilient coating surrounding the spongy material.

7. The syringe according to claim 1 wherein the syringe needle is characterized by a predetermined diameter, and wherein the piercing needle of the floating piston is characterized by a diameter equal to or greater
5 than the diameter of the syringe needle.

8. For use in conjunction with a syringe of the type comprising a syringe body having a hollow interior, a hollow syringe needle mounted at one end of the syringe body and coupled in fluid communication with the interior thereof, and a plunger mounted for movement within the syringe body toward the syringe needle to force fluids contained within the syringe body outwardly through the syringe needle, the plunger further comprising a piston forming a fluid tight seal with the interior of the syringe body, a floating piston adapting the syringe for the sequential administration of different fluids comprising:

means forming a fluid tight seal with the interior of the syringe body which divides the syringe body into a first portion for receiving a first fluid to be administered and a second portion for receiving a second fluid to be administered; and

means for connecting the second portion of the syringe body in fluid communication with the syringe needle after the first fluid to be administered has been discharged from the syringe body through the syringe needle under the action of the plunger.

9. The syringe according to claim 6 wherein the floating piston is further characterized by an upper portion forming a fluid tight seal with the interior of the syringe body, a lower portion comprising resilient means,
5 and a piercing needle mounted in and supported by the resilient lower portion and having a hollow interior.

10. The syringe according to claim 9 wherein the resilient means of the lower portion comprises a spongy material.

10 11. The syringe according to claim 9 wherein the resilient means of the lower portion comprises a gas.

12. The syringe according to claim 9 wherein the first portion of the floating piston comprises a non-coring elastomeric material.

15 13. The syringe according to claim 9 wherein the lower portion of the floating piston comprises a spongy material having the piercing needle mounted therein and a resilient coating surrounding the spongy material.

14. The syringe according to claim 8 wherein the syringe needle is characterized by a predetermined diameter, and wherein the piercing needle of the floating piston is characterized by a diameter equal to or greater
5 than the diameter of the syringe needle.

15. For use in conjunction with a syringe of the type having a cylindrical barrel, a floating piston including a fluid tight seal which initially separates first and second portions of the syringe barrel and a piercing needle which
10 penetrates the fluid tight seal to connect the first and second portions of the syringe barrel in fluid communication.

16. A syringe for sequentially administering different fluids comprising:

a syringe body having a hollow interior for receiving the fluids to be administered;

5 a syringe needle mounted at one end of the syringe body for administering the fluids therefrom;

a plunger mounted within the interior of the syringe body for movement therein toward the end of the syringe body comprising the syringe needle to force fluids
10 outwardly from the interior of the syringe body through the syringe needle;

the plunger further comprising a piston forming a fluid tight seal with the interior of the syringe body;

a floating piston slidably supported within the
15 hollow interior of the syringe body and forming a fluid tight seal with the syringe body which divides the syringe body into a first portion for receiving the first fluid to be administered and a second portion for receiving the second fluid to be administered; and

20 the floating piston further comprising valve means for initially maintaining separation between the first and second fluids and for connecting the second fluid to be administered in fluid communication with the syringe needle after all of the first fluid to be administered has
25 been discharged therethrough.

17. The syringe according to claim 16 wherein the floating piston comprises a body formed from a resilient material which forms a fluid tight seal with the syringe body.

5 18. The syringe according to claim 16 wherein the resilient material comprises a spongy material.

10 19. The syringe according to claim 16 wherein the floating piston has a top surface facing the plunger of the syringe and a bottom surface facing the needle of the syringe, wherein the floating piston has an aperture extending therethrough from the top surface to the bottom surface, and wherein the valve means is mounted in the aperture of the floating piston.

15 20. The syringe according to claim 19 wherein the valve means comprises an imperforate top plate normally engaging the top surface of the floating piston and extending over the entirety of the aperture formed through the floating piston at the intersection thereof with the top surface.

21. The syringe according to claim 20 wherein the valve means further includes a substantially rigid actuating member secured to the imperforate top plate and extending therefrom through the aperture formed through the floating piston at least to the intersection thereof with the bottom surface of the floating piston, the actuating member being responsive to engagement of the floating piston with the end of the syringe body having the needle mounted therein to disengage the imperforate top plate from the floating piston thereby facilitating fluid flow through the aperture formed through the floating piston.

22. The syringe according to claim 21 wherein the valve means further includes a perforated bottom plate secured to the end of the actuating member remote from the point of attachment thereof to the top plate for normally retaining the imperforate top plate in engagement with the top surface of the floating piston.

23. The syringe according to claim 22 wherein the floating piston comprises a resilient material and wherein the imperforate top plate and the perforated bottom plate comprising the valve means normally retain the resilient
5 material comprising the floating piston in a slightly compressed condition thereby retaining the imperforate top plate in engagement with the top surface of the floating piston.

24. The syringe according to claim 23 wherein further
10 movement of the plunger within the syringe body toward the end of the syringe body comprising the syringe needle following engagement of the floating piston with the end of the syringe body having the needle mounted therein causes compression of the resilient material comprising the
15 floating piston thereby disengaging the imperforate top plate of the valve means from the top surface of the floating piston to facilitate flow of the second fluid through the aperture formed in the floating piston and through the syringe needle.

20 25. The syringe according to claim 24 wherein the floating piston comprises a resilient, spongy material which maintains a fluid tight seal with the interior of the syringe body.

26. For use in conjunction with a syringe of the type comprising a syringe body having a hollow interior, a hollow syringe needle mounted at one end of the syringe body and coupled in fluid communication with the interior thereof, and a plunger mounted for movement within the syringe body toward the syringe needle to force fluids contained within the syringe body outwardly through the syringe needle, the plunger further comprising a piston forming a fluid tight seal with the interior of the syringe body, a floating piston adapting the syringe for the sequential administration of different fluids comprising:

resilient means forming a fluid tight seal with the interior of the syringe body which divides the syringe body into a first portion for receiving a first fluid to be administered and a second portion for receiving a second fluid to be administered; and

valve means for connecting the second portion of the syringe body in fluid communication with the syringe needle after the first fluid to be administered has been discharged from the syringe body through the syringe needle under the action of the plunger.

27. The syringe according to claim 26 wherein further characterized by a floating piston comprising a body formed from a resilient material which forms a fluid tight seal with the syringe body.

5 28. The syringe according to claim 26 wherein the resilient means comprises a spongy material.

29. The syringe according to claim 26 wherein the resilient means comprises a floating piston having a top surface facing the plunger of the syringe and a bottom
10 surface facing the needle of the syringe, wherein the floating piston has an aperture extending therethrough from the top surface to the bottom surface, and wherein the valve means is mounted in the aperture of the floating piston.

15 30. The syringe according to claim 29 wherein the valve means comprises an imperforate top plate normally engaging the top surface of the floating piston and extending over the entirety of the aperture formed through the floating piston at the intersection thereof with the
20 top surface.

31. The syringe according to claim 30 wherein the valve means further includes a substantially rigid actuating member secured to the imperforate top plate and extending therefrom through the aperture formed through the floating piston at least to the intersection thereof with the bottom surface of the floating piston, the actuating member being responsive to engagement of the floating piston with the end of the syringe body having the needle mounted therein to disengage the imperforate top plate from the floating piston thereby facilitating fluid flow through the aperture formed through the floating piston.

32. The syringe according to claim 31 wherein the valve means further includes a perforated bottom plate secured to the end of the actuating member remote from the point of attachment thereof to the top plate for normally retaining the imperforate top plate in engagement with the top surface of the floating piston.

33. The syringe according to claim 32 wherein the floating piston comprises a resilient material and wherein the imperforate top plate and the perforated bottom plate comprising the valve means normally retain the resilient material comprising the floating piston in a slightly compressed condition thereby retaining the imperforate top plate in engagement with the top surface of the floating piston.

34. The syringe according to claim 33 wherein further movement of the plunger within the syringe body toward the end of the syringe body comprising the syringe needle following engagement of the floating piston with the end of the syringe body having the needle mounted therein causes compression of the resilient material comprising the floating piston thereby disengaging the imperforate top plate of the valve means from the top surface of the floating piston to facilitate flow of the second fluid through the aperture formed in the floating piston and through the syringe needle.

35. The syringe according to claim 34 wherein the floating piston comprises a resilient, spongy material which maintains a fluid tight seal with the interior of the syringe body.